Tropical Products Institute

INTERIM REPORT ON THE USE OF NON-WHEAT FLOURS IN BREADMAKING

DAV DENDY AND PA CLARKE

Errata p. 18 Plate 12 (b) delete :
(compare with 15a)

p. 24 Recipe 1 line 9 insert after Oxidant (Bromate) 75 :
p.p.m.

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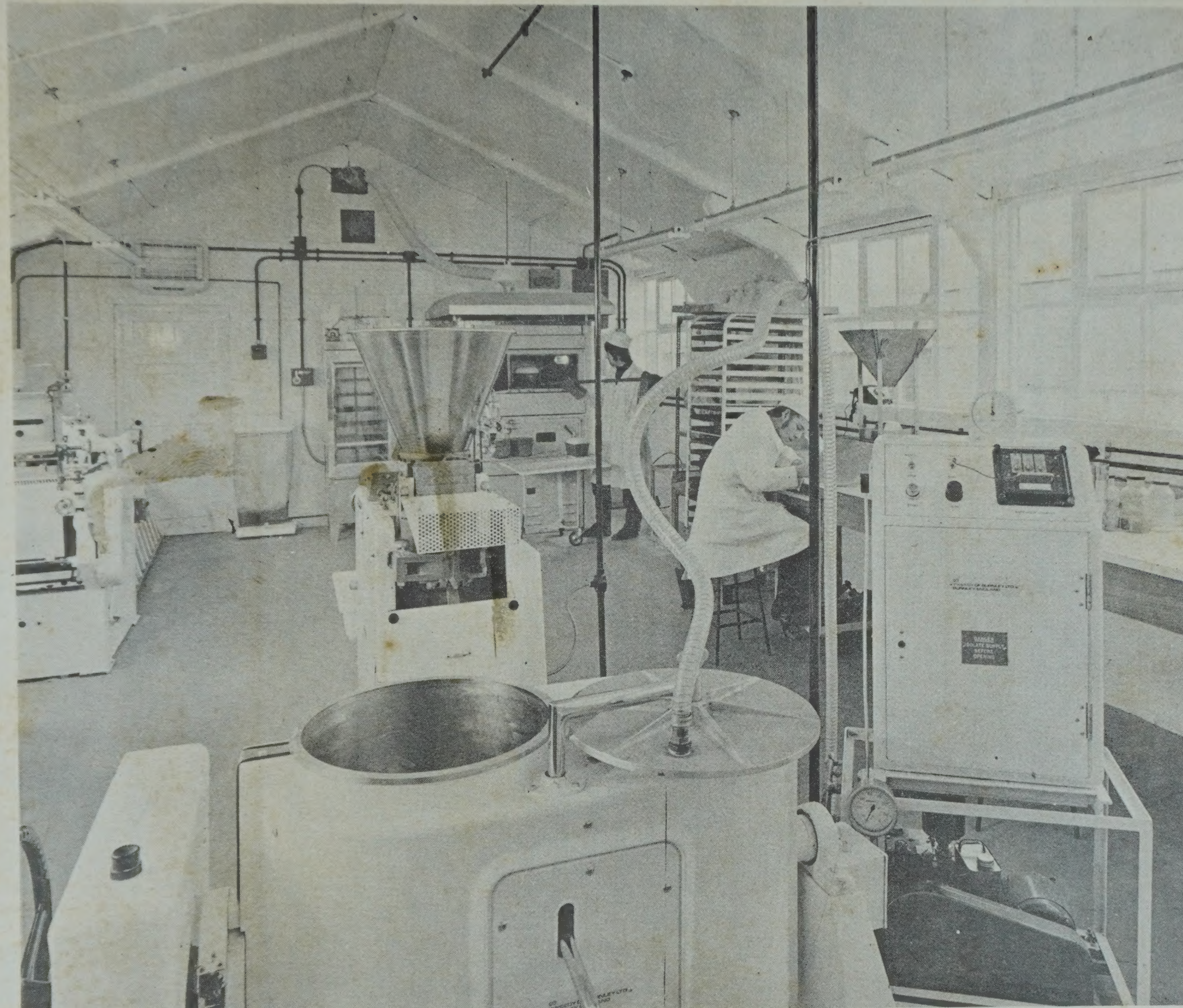


Plate 1 Bakery at Industrial Development Department, Culham.

Interim Report on the Use of Non-Wheat Flours in Breadmaking

by

D A V Dendy and P A Clarke

SUMMARY

Experiments in the Test Bakery at the Industrial Development Department of TPI have led to the development of bread of good quality, made by mechanical dough development from a blend of 50 per cent wheat flour and 50 per cent cassava starch. This bread can be satisfactorily fortified with protein concentrates derived from, for example, coconut or soya, and it has also been made successfully in a commercial bakery. In this Report, full details are given of the work carried out during the evolution of suitable formulae and methods, and a brief note on future work is appended.

INTRODUCTION

This is the first six-monthly report on the work of the TPI Test Bakery at Culham (Plate 1). It is therefore worthwhile to relate briefly how the Bakery project came into being and to restate its aims and objectives.

Bread from wheat has been used in the Mediterranean Basin for many thousands of years. Frequently other materials - notably barley - have been used to dilute the wheat in times of scarcity.

As a food material, bread has several advantages:-

a. convenience - it is bought from a baker ready to eat;

b. balanced nutrients - it contains carbohydrate, protein (9 - 12 per cent dry weight), B vitamins and minerals;

c. keeping qualities - bread can be kept for several days;

d. it is a convenient accompaniment for high protein foods - such as cheese and meat.

Further, protein, vitamins, minerals, etc., can be added to the flour to give an enriched loaf of high dietary value. As a staple food, bread is superior to many both organoleptically and as a source of nourishment.

The habit of eating bread made from wheat spread throughout the world, and bread is now available in at least the larger towns of most developing countries. For climatic reasons, few of these countries grow wheat; imported wheat must be paid for with scarce foreign currency. It would clearly be to their economic advantage if imports of wheat could be reduced or even eliminated. FAO therefore instigated two projects:-

The first, at the Institut voor Graan, Meel en Brood, TNO, Wageningen, w to develop a bread from non-wheat materials. These efforts have led to several publications, of which the paper "Bread from Non-wheat Flours", b Kim and de Ruiter (Food Technology, 22, 1968, 55) gives a very good summ of their achievements. Work on bread free of gluten (the extensible protein wheat that gives to bread its unique and much-desired texture) is not new, f dietetic breads for use by patients suffering from coeliac disease have been developed, using various starches but omitting the gluten. Bread without gluten, whether made for coeliac patients or by the TNO process, has the c and crumb structure of cake rather than bread and might not be considered organoleptically acceptable to those people already used to conventional bre as part of the diet.

The second project was begun at the British Arkady Company where J H Hul from FAO and a team from British Arkady, led by W Pringle, and backed b the laboratory facilities under A Williams, carried out preliminary studies the partial replacement of wheat flour by other materials, using mechanical dough development rather than bulk fermentation for the ripening of the doug since it has been shown at the Flour Milling and Baking Research Associatio (Chorleywood) that weaker flours can be used for bread-making by this techn The composite flour made by blending strong wheat with a glutenless flour is course, weaker for breadmaking purposes than an all-wheat bread flour. T preliminary work of Hulse, Pringle and Williams is published in Cereal Scie Today, 14/3, 1969, 114, and is discussed later in this Report.

The TPI Test Bakery at Culham was established in March 1969 to continue th work already started by Hulse, Pringle and Williams, and to act as a servic any developing country requiring advice, research or training facilities in th field of Bakery Technology.

Before starting experimental work, the objectives of the project were analys and stated as follows:-

> The objective of the project "Use of Composite Flours in Breadmaking" to evolve methods and formulae for making bread of acceptable quality "composite flours", these being blends of strong wheat flour with a non- wheat flour, fortified, if necessary, with protein-rich additives. The term "non-wheat flour" is used to include root starches and non-gluten- forming cereal flours. Initially samples of these materials would be obtained from developing countries and if these can be used to make a satisfactory bread, a baker will be sent abroad to carry out trials in local bakeries and to explore public reaction to the product.
>
> The economic benefits are considered to be, for developing countries a using imported wheat flour, a considerable saving in foreign currency caused by lowering the imports of wheat flour, or a larger production o bread from the quantity already imported; for countries not yet import wheat flour, and where malnutrition is endemic, gifts of wheat flour ca be extended by dilution with local materials so that a larger section of t population will benefit.

A brief outline of the kind of work required was drawn up as a "Suggested Programme of Work", after discussion with British Arkady Company, the Flour Milling & Bakery Research Association (Chorleywood) and FAO. Very briefly, the programme of work consisted of three sections. Firstly, long-term studies of composite flour technology. These would include a thorough study of the Hulse, Pringle and Williams breads; where possible extending their work. Starch sources other than cassava would be studied, and protein supplements other than soya. Additives such as oxidants, emulsifiers, anti-staling and anti-mould agents would be studied for their effect on bread from composite flour. Secondly, work for the developing countries would be carried out at their request and it would be hoped that after a preliminary study of local starch or protein source at Culham, a TPI Bakery Technologist would work in the developing country under bilateral or UN Technical Assistance, demonstrating the making of bread from composite flour in local bakeries and exploring public reaction to the product. Thirdly, training: the TPI Bakery is able to give training in the techniques of bread-making, especially using composite flours. The optimum length of training period will, of course, depend on the trainees' knowledge and experience of bakery technology, and their particular objectives.

This programme of work has been followed as far as possible, revisions being undertaken in the light of work as it proceeds.

It is worthwhile at this stage to describe very briefly the methods used in Britain for breadmaking.

More than three-quarters of the bread eaten in Britain is made by mechanical dough development, also known as the "Chorleywood Bread Process". This was developed by scientists at the Flour Milling and Bakery Research Association, located at Chorleywood. The process eliminates the long (up to four hours) bulk fermentation required by traditional breadmaking methods. To effect the necessary ripening or development of the dough, a large amount of mechanical work is performed on the dough in a very short time (four minutes). Certain additives are necessary and more yeast must be used, but the expense of these is more than offset by the use of less labour, less space, greater standardisation and, above all, in the use of weaker flours. Since the adoption of the Chorleywood Bread Process in the late 1950's, the proportion of strong imported wheat, mostly Canadian, used in breadmaking, has been reduced from 65 per cent to 35 per cent, the rest being weak homegrown wheat which cannot tolerate a lengthy fermentation.

The TPI Test Bakery at Culham opened on 3.3.69 when Mr P A Clarke took up duty as Bakery Technologist. On September 3rd Mr A W James, formerly a Consultant Baker in Kenya, joined the team.

Equipment - The items of equipment used at the start of this period were:-

- Tweedy 35 high-speed mixer for mechanical development of dough;
- Europa Divider for dividing dough into pieces of equal weight;
- Jacomolda for sheet moulding the dough;
- Mason oven for baking bread. For the first month the lower deck of this oven was used as a proving cabinet for final-proof.
- A gift of equipment from Oxford Co-operative Bakery was gratefully received: this included bakery trolleys, utensils and bowls.

Initially, intermediate proof was carried out at ambient temperature under cloths on the bench but later a pair of cabinets was purchased.

A proving cabinet for final proof was delivered in mid-March but the thermo control did not work and had to be replaced. Later the inside of this cabine was rebuilt to allow a greater number of dough samples to be proved.

Towards the end of the period, apparatus for measuring oven spring and loaf volume was obtained, and a Morton Duplex dual speed mixer was brought int use. The TPI electrician has constructed a watt-hour meter so that the Mo mixer can now be used for the Chorleywood Bread Process on a half to one-a a-half kg. scale. The Morton mixer has been correlated with the Tweedy so that valid results, suitable for scale up, are now obtained. This will prove extremely useful when working with small (e.g. air-mailed) samples.

During the first six-months, bread assessment, apart from oven spring and loaf height has been qualitative.

Materials

Strong Canadian wheat flour (Castle brand) is obtained from Russell & Baird contains 14.5 per cent protein (N x 5.70). For day-to-day control (Plate 2) a local baker's grade flour is used, obtained from Clark & Co. Ltd. of Wantage and containing 12.5 per cent protein. Australian flour is obtained from Russ Baird Ltd. and contains 10.5 per cent protein. Cassava starch is obtained fr Laing National Ltd. and is a high-grade Thailand tapioca.

Cassava/wheat Blends

The paper, "Mechanically Developed Doughs from Composite Flours", by Hulse, Pringle and Williams, describes some of the first attempts in recent years to make bread from blends of wheat flour with other starch materials; these were cassava, maize starch and 'millet/sorghum'. Soya and sometim fish protein concentrate (FPC) were used to bring the protein level to 12 per cent. Generally speaking, the composite flour contained 66 per cent of stron Canadian wheat flour (Castle). Hulse, Pringle and Williams only used mechanical dough development and in most of the experiments the flour was fortified with protein. Initially, this work was repeated and gradually chang were made to the recipe, described under various headings below (fat, yeast, oxidant, etc.)

It was decided to try to include the largest possible amount of cassava starch and bread was made using Recipe 2 (the recipes are at the end of this report) but varying the proportion of cassava from 0 to 60 per cent. The experimen was carried out with "Castle", "Clark's" and Australian flours. Even witho dilution the last gave a poor loaf. Plate 3 (a) to (e) shows bread containing 0, 10, 20, 30, and 40 per cent cassava with the Australian flour. For the other two the graphs (fig. 1.) of oven spring (the only physical property measurable at that time) against percentage were obtained. Plate 4 (a) to (e shows bread containing 0, 10, 20, 30, and 40 per cent cassava with the Clark's flour. It is clearly no use diluting the Clark's flour to the extent of 50 per cent, the maximum to give an acceptable product being around 20 per cent; but the Castle flour will withstand 50 per cent dilution (Plate 5) and still give moderately good loaf with a fair oven spring.

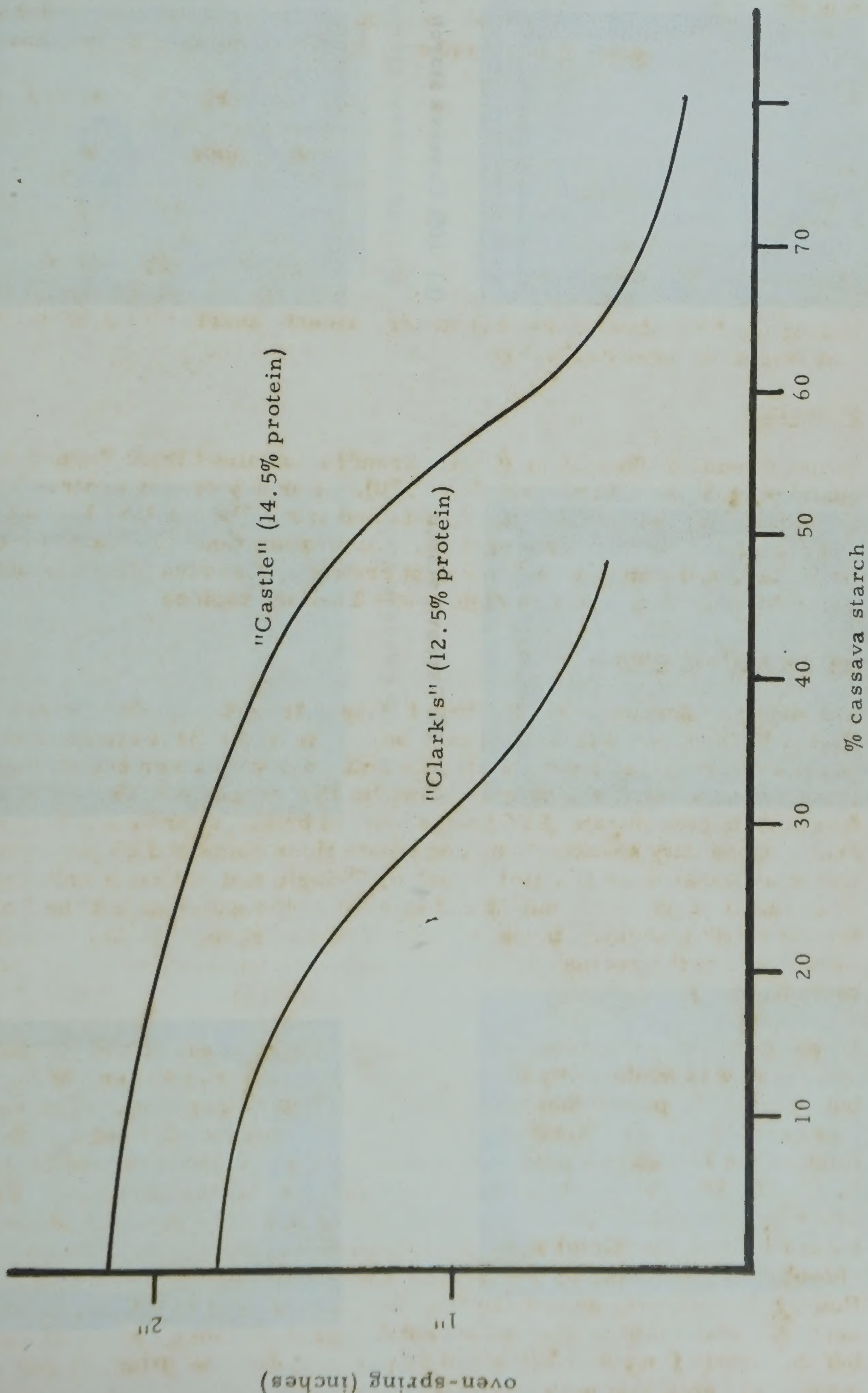
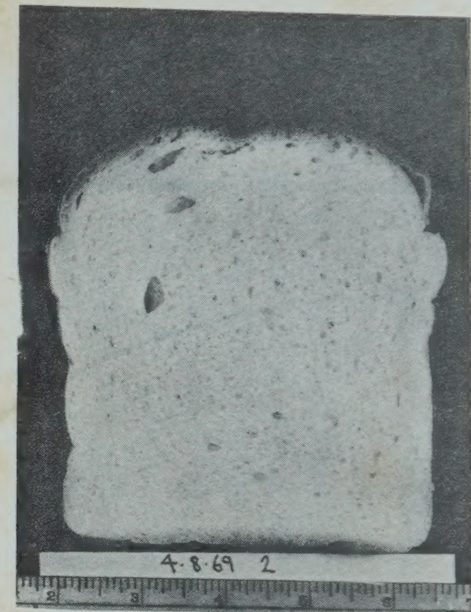

"Castle" (14.5% protein)
"Clark's" (12.5% protein)
10
20
30
40
50
60
70
% cassava starch
1"
2"
oven-spring (inches)

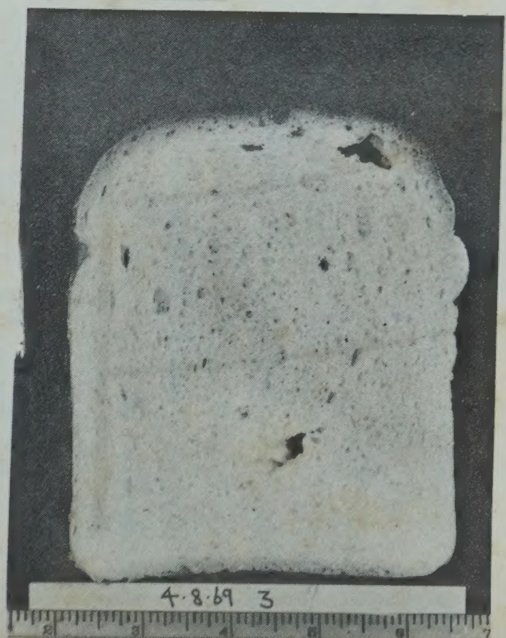
Figure 1

Plate 3 Recipe 2 Cassava starch/ Australian wheat flour.

(a) 0% Cassava starch

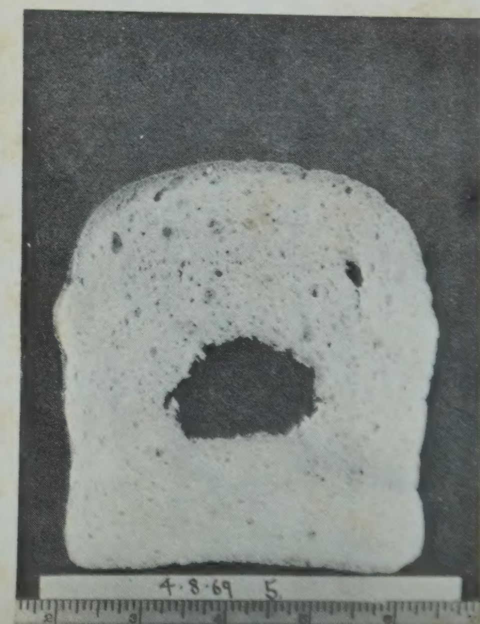


(b) 10% Cassava starch

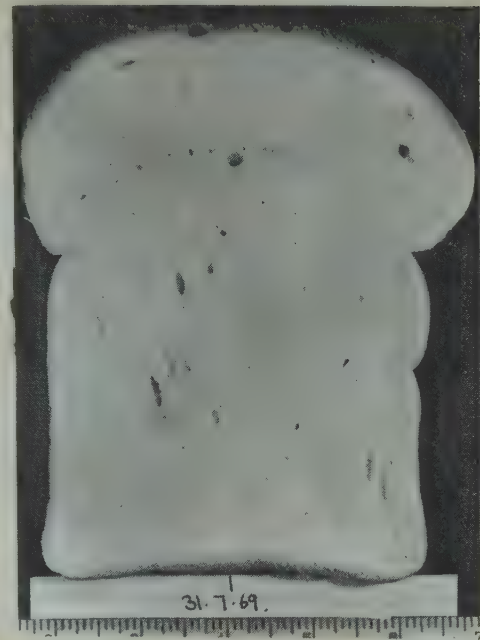


(c) 20% Cassava starch

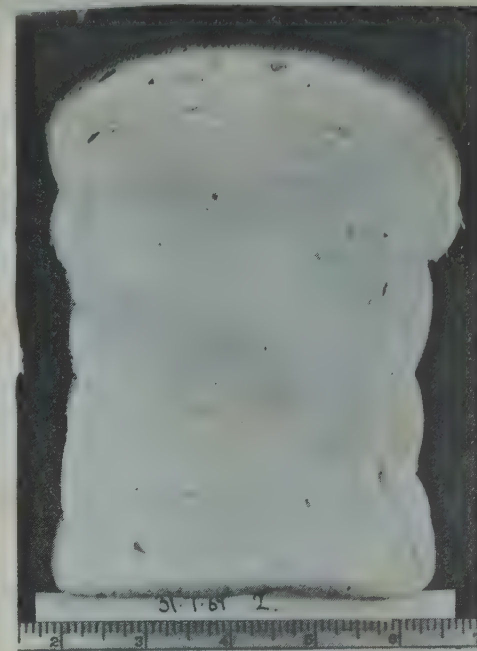
(d) 30% Cassava starch



(e) 40% Cassava starch



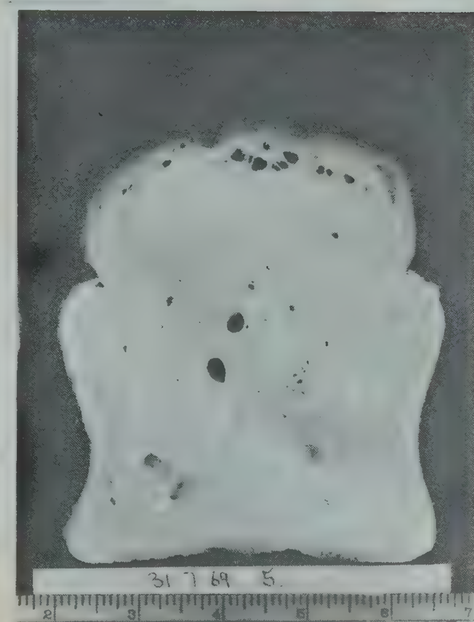
(a) 0% Cassava starch



(b) 10% Cassava starch

(c) 20% Cassava starch

(d) 30% Cassava starch



(e) 40% Cassava starch

Plate 5 Recipe 2 50/50 Cassava starch/ strong Canadian Wheat flour ("Castle")

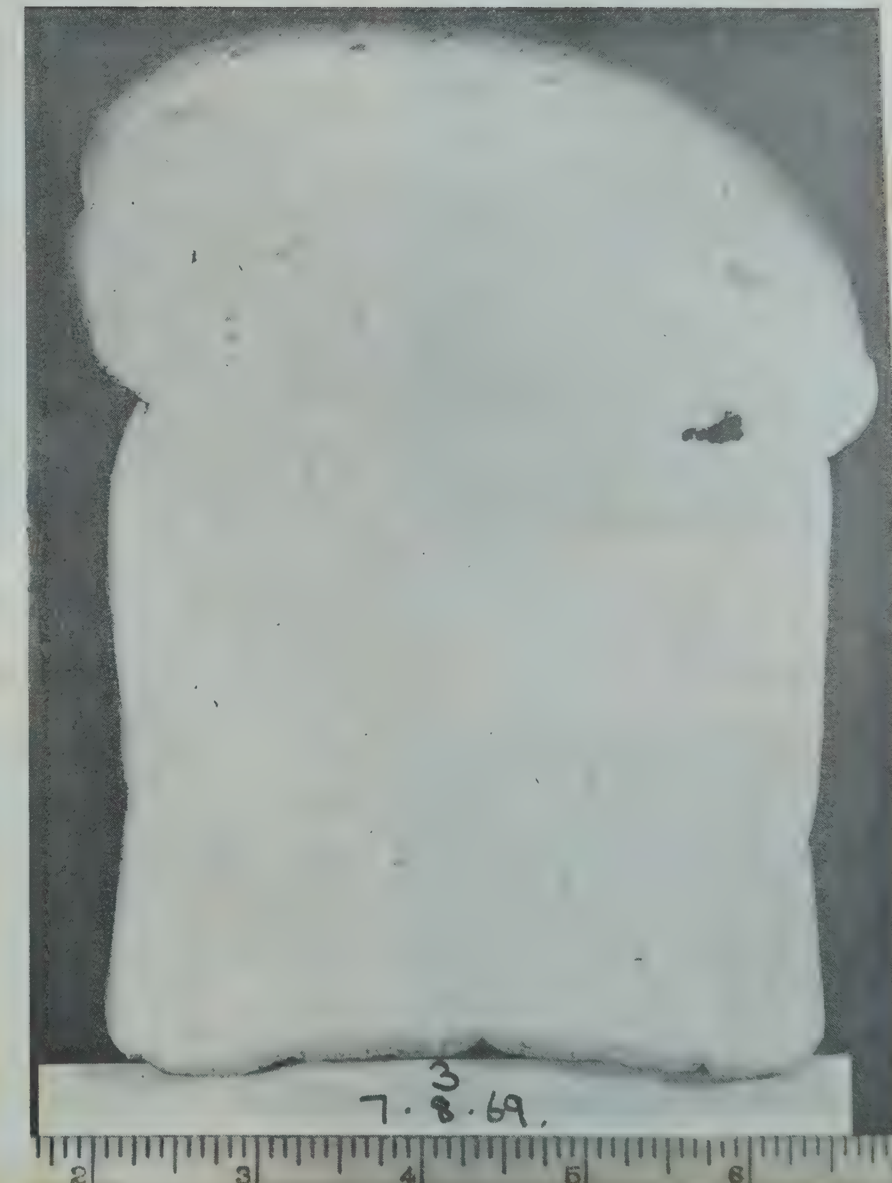


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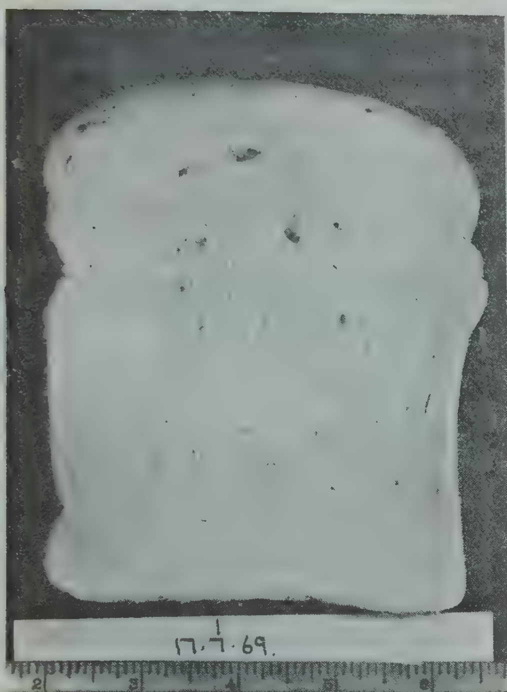
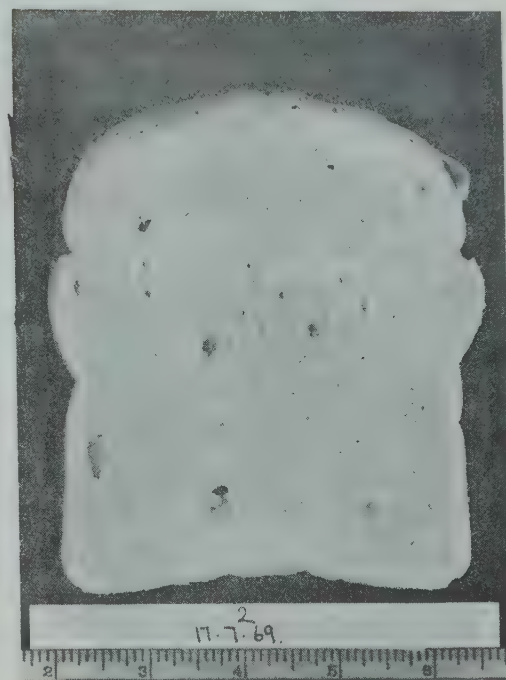
Plate 2 100% Wheat flour (Clark's" baker's grade)

Plate 6 Recipe 3 50/50 Cassava starch/Castle wheat flour



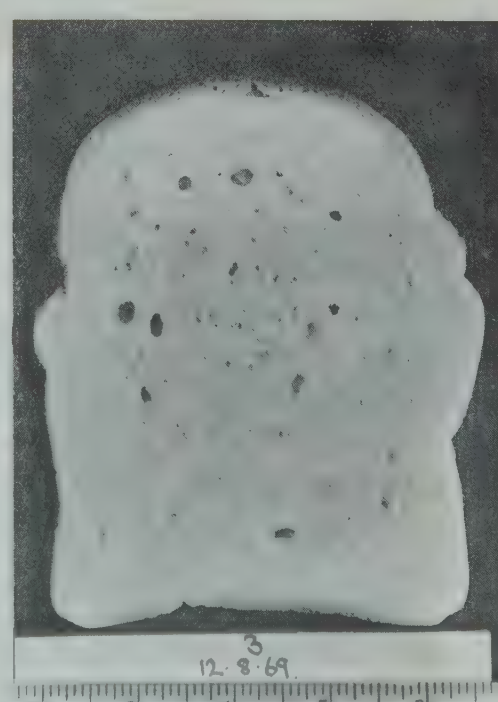
(a) half usual amount of yeast "grown" for 1 hour



(b) usual amount of yeast

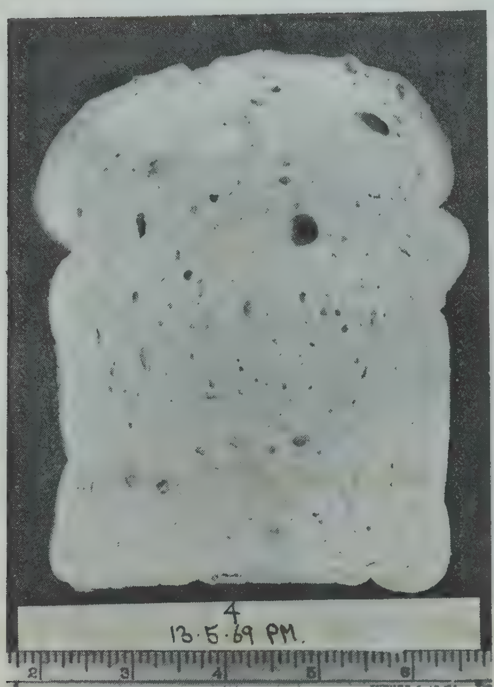
Plate 7 Comparison of "new delivery" with "old" dried yeast, using 50/50 "Castle" wheat flour/Cassava starch.

(a) New delivery yeast at 1.3% flour weight



(b) Old yeast at 1.5% flour weight

Plate 8 Comparison of 2 oxidants.



(a) 200 ppm Potassium Bromate Recipe 1

(b) 150 ppm Ascorbic Acid Reci

Yeast

In the Hulse, Pringle and Williams work, compressed yeast was used. It is known that almost all developing countries use imported dried yeast since compressed yeast does not keep in the normal conditions of shipping. It was, therefore, decided that dried yeast should be used for bread-making experiments at TPI. A suitable level of reconstituted dried yeast was found that would give results equal to those obtained with compressed yeast. Approximately 40 per cent by weight of dried yeast compared to compressed yeast was needed, the yeast being reconstituted in the approved fashion by making a slurry with water to which sucrose has been added and leaving this brew to stand for fifteen minutes. Because of high yeast levels used in the Chorleywood bread process, tests were carried out to lessen the amount of yeast used. A reduction of 40 - 50 per cent in the initial yeast usage was achieved by aerobic yeast growth in a 10 per cent sucrose solution with small amounts of yeast nutrient. This suspension was allowed to ferment for one hour before adding to the dough. The dough contained 300 ppm flour weight of ammonium chloride as a yeast stimulant. The bread obtained (recipe 3) was equal to the control. Plate 6 shows bread from "grown" yeast (6a) compared with the control (6b).

It is interesting to note how important it is to check each new delivery of dried yeast. For the August delivery gassing results were abnormally good and a 10 - 15 per cent reduction in yeast usage could be achieved. Plate 7a shows bread from new delivery yeast compared with the control, 7b.

Oxidants

Two oxidants have been studied - potassium bromate and ascorbic acid, both separately and together. Initially samples of ascorbic acid gave poor results but a fresh sample was satisfactory and fresh supplies of ascorbic acid are now being stored in the refrigerator.

High bromate levels (200 ppm) gave excellent loaf volume (Plate 8a) with the Hulse, Pringle and Williams formula (Recipe 1). Efforts were made to lower the level of oxidants, but without success. However, substitution of glyceryl monostearate (GMS) by bread-fat (a high slip-point fat) led to good bread with the 50/50 recipe, using either bromate or ascorbic acid and for future work the level of 150 ppm ascorbic acid was chosen (Plate 8b) (in a large-scale production plant bakery, only half this quantity would be necessary and this would be the same as is sometimes used in commercial bread). Ascorbic acid is preferred to bromate as the latter leaves a residue of potassium bromide in the loaf. In spite of this, there is no limit set to the use of bromate in the United Kingdom (high levels are self-limiting through the physical effect on the loaf).

Fat

By using a high slip-point (43°C) fat ("bread fat") at 0.7 - 1.4 per cent (flour/weight basis), instead of GMS, bread equal in volume and crumb texture to the Hulse, Pringle and Williams 50/50 loaf was obtained and this bread did not stale as rapidly (Recipe 2). Plate 9 (a) to (d) shows 50/50 bread made with 0, 0.35, 0.7, and 1.4 per cent fat. For comparison, qualitative staling rates

are as follows:-

"Small baker's" all wheat	4 days
Plant type all wheat (sliced and wrapped)	5 - 6 days
Hulse, Pringle and Williams 50/50 (GMS)	1 - $1\frac{1}{2}$ days
Hulse, Pringle and Williams 50/50 (fat)	2 days

In most tropical countries bread will probably go mouldy at an accelerated rate so that the use of fat will give a loaf of sufficiently low staling-rate (staling-rate is inversely proportional to temperature, so that the elevated temperature of the tropical regions lowers the staling-rate of bread but, of course, will increase the drying out or, in humid regions, the rate of mould growth).

Sugar

When using dried yeast it was found that the yeast was slow in fermenting the diastatically produced maltose. On the addition of sucrose to the dough at 1 per cent flour weight, good gassing results and a satisfactory loaf were obtained.

Sucrose is also added to the yeast brew before the yeast is mixed with the flour. Sugar (sucrose) is available very cheaply in many developing countries.

Work Input

Using a 50/50 formula the work input was varied from 6 to 13 watt hours per Kg. dough. Best results were obtained at 11 watt hour per Kg. which is the usual work level for commercial bread in the United Kingdom (i.e. 0.4 H.P/min lb. or 5 watt hrs/lb.)

Vacuum

For the 50/50 bread the best texture was obtained by using reduced pressure (400 mm) (Plate 10c), during the mechanical dough development in a range of experiments from 200 mm to ambient pressure. (Plate 10a)

Processing

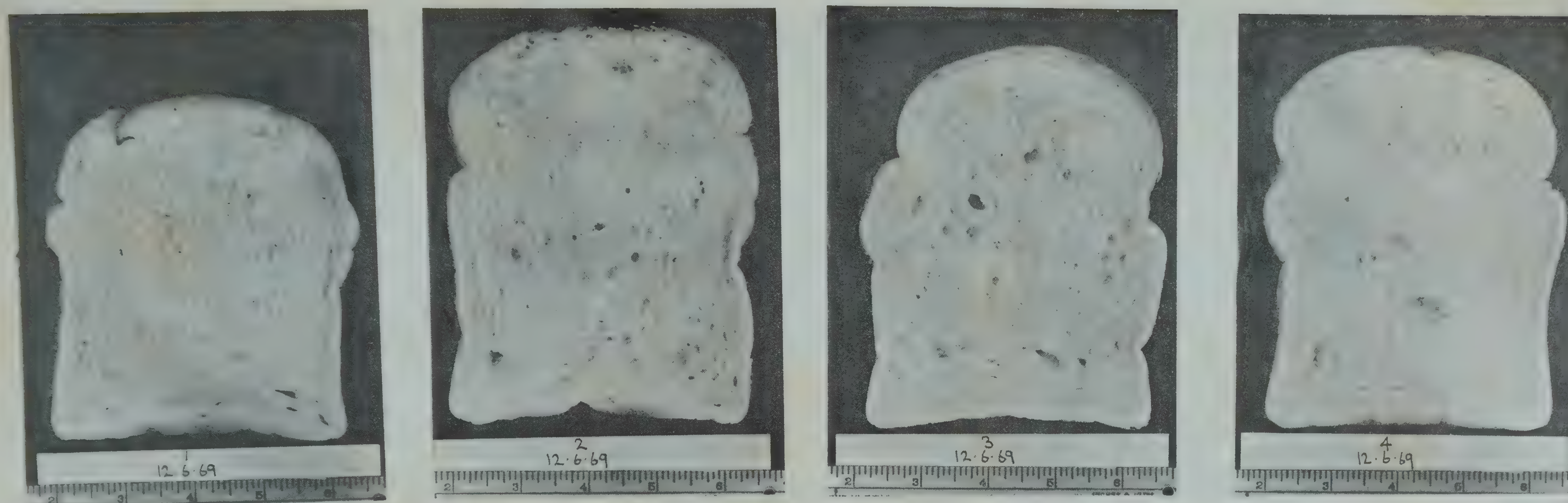
The texture of the 50/50 loaf could be further improved by using the 4 piece cross-panning technique (Plate 11c) rather than the one-piece technique (Plate 11a) usually used in Test Bakeries. Plate 11b shows the results of the two-piece twist technique. However, the one-piece technique will continue to be used as it gives a plainer loaf, easier to assess quantitatively.

Protein Supplementation

Samples of protein concentrates have been used to fortify the 50/50 loaf.

1. Cottonseed flour from EAIRO - Nairobi. 3 per cent cottonseed flour (at 100 per cent protein, N x 6.25) gave a loaf of extremely strong cottonseed flavour and poor texture and colour. Loaf volume was inferior.

Plate 9 Comparison of different percentages of fat in recipe 2, based on flour weight.



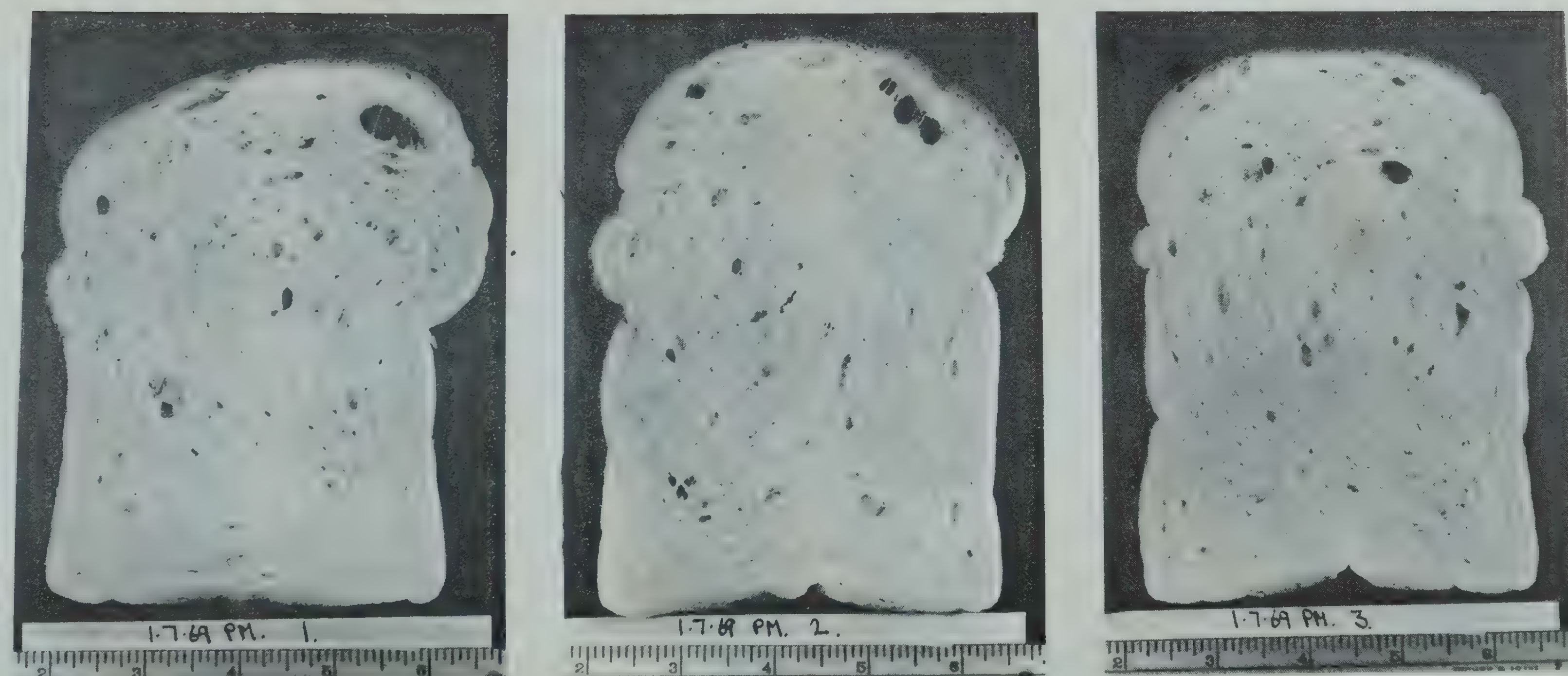
(a) 0%

(b) 0.35%

(c) 0.7%

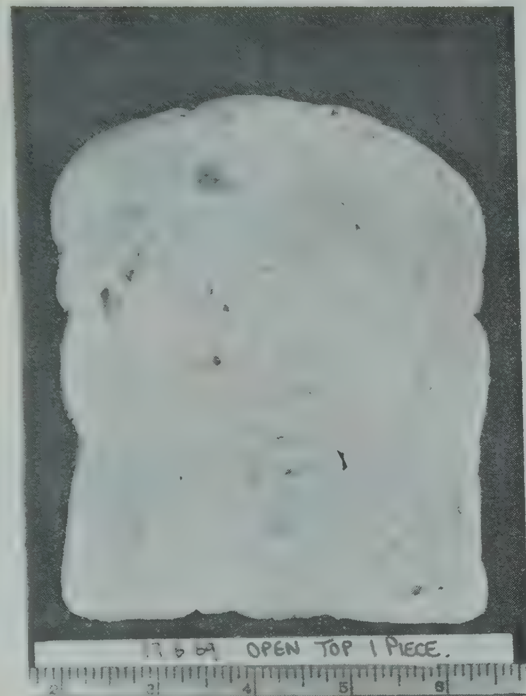
(d) 1.4%

Plate 10 Effect on texture of vacuum during mechanical dough development.

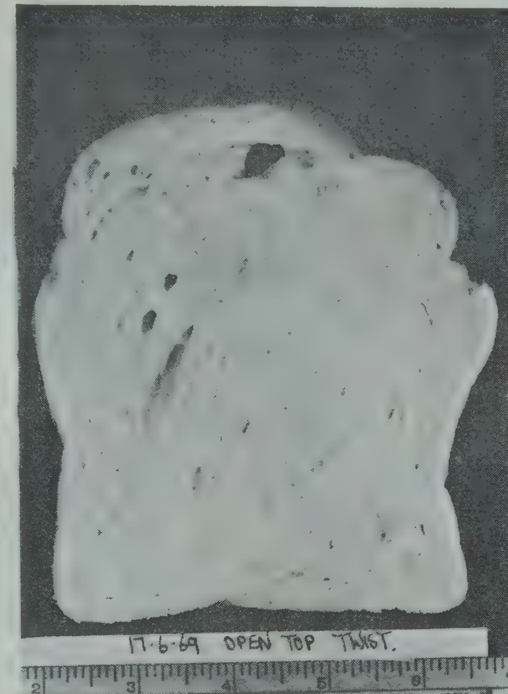


(a) Ambient (b) 600 mm Hg (c) 400 mm Hg

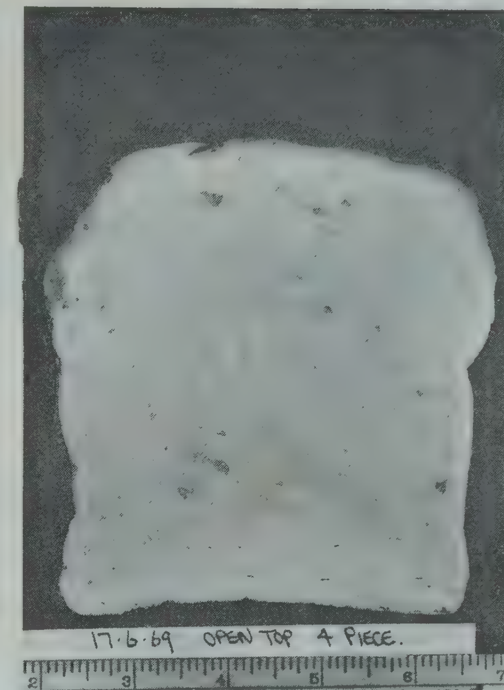
Plate 11 Effect on texture of using different processing techniques after sheet-moulding.



(a) 1-piece

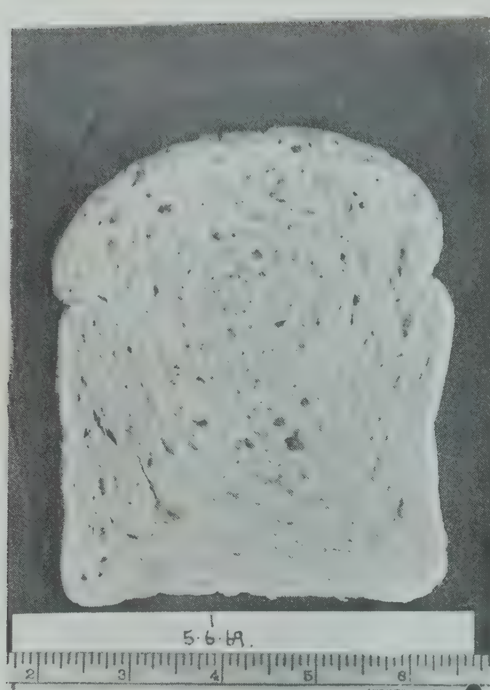


(b) 2-piece twist

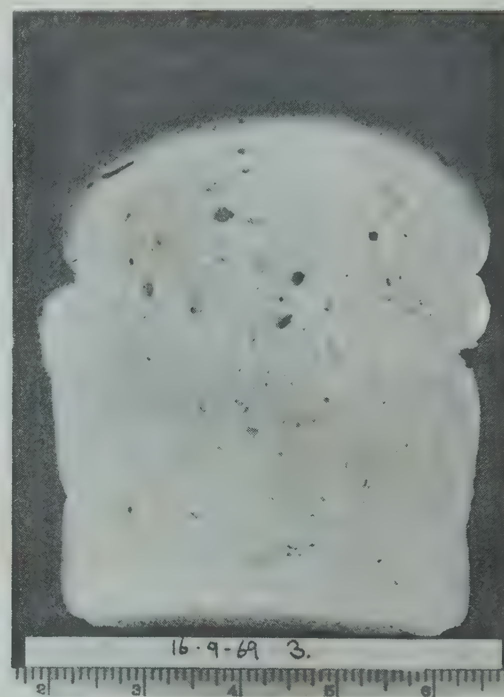


(c) 4-piece cross-panning

Plate 12 Protein supplementation, recipe 4



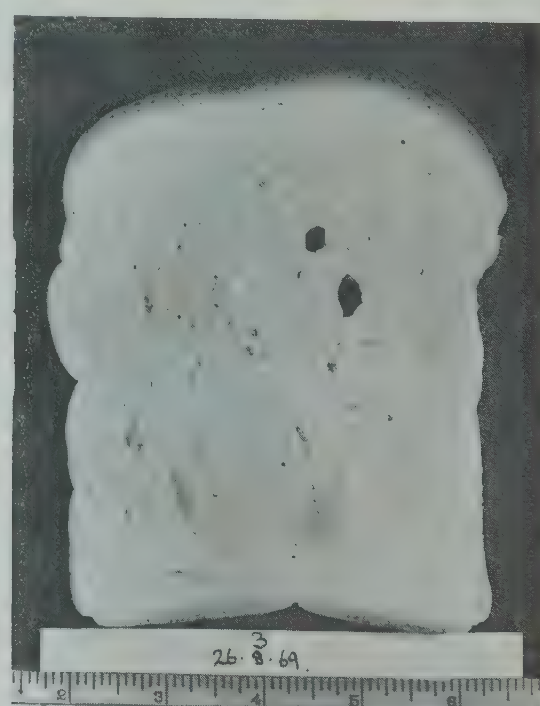
(a) 3% coconut protein



(b) 3% white coconut protein (compare with 15a)

Plate 13 Protein supplementation. Cassava starch/ wheat flour with soya.

(a) 50% cassava starch without soya



(b) 50% cassava starch with 6% defatted soya flour

2. Fish protein concentrate (88 per cent, N x 6.25) - 3 per cent, (as in 1) gave a grey crumb, very poor volume and a strong flavour of protein hydrolysate.

3. Coconut protein (80 per cent, N x 6.25) obtained from TPI Project 246 was used at 3 and 5 per cent levels. Each gave an excellent loaf. There was no adverse effect on crumb softness, loaf volume or flavour. The colour of the loaf was light brown but was not unpleasant. (Plate 12a). Recently "white" protein (N x 6.25 = 92 per cent) has been produced, and its use at 3 or 5 per cent levels gave similar results to the brown protein but also a white crumb (Plate 12b) (Recipe 4). Plates 12 (a) and (b) should be compared with 13a, of the 50/50 cassava/wheat loaf without supplementation.

4. Defatted Soya flour (N x 6.25 = 50 per cent) was added at 6 per cent flour weight to 50/50 cassava/wheat bread. The products possessed a slightly yellow crumb with very slight decrease in volume. Slight soya flavour was detectable but would not be unacceptable. (Plate 13b) (Plate 13a shows the 50/50 bread without soya).

Other Starch Sources

So far little work has been done on the use of materials other than cassava in diluting wheat flour.

Rice flour at 50 per cent level gave very poor results. A loaf containing 40 per cent rice flour to 60 per cent wheat flour gave a loaf of reasonable volume and excellent crumb softness.

Remembering that rice is still an expensive cereal in most countries, a blend of rice and cassava was used to dilute the wheat flour. A loaf containing 40 per cent cassava and 10 per cent rice had good volume and texture and excellent flavour and crumb softness. (Plate 14) (Recipe 5).

It might be possible for some developing countries to add a small amount of rice flour to a cassava/wheat blend to mollify the harshness of the crumb of the cassava/wheat loaf and to improve the flavour.

Plant Bakery Test

Having shown in the TPI Test Bakery that it is possible, on a small scale, to make bread containing only 50 per cent of wheat flour, it was considered desirable to make bread on a plant scale in a commercial bakery.

A local commercial bakery offered TPI the use, for a short period, of their plant. A small mixer, Tweedy 70, was used to prepare a dough using Recipe 6. The plant normally would use the Tweedy 280 but this scale of operation was considered too large and would have occupied the plant for a longer period. Due to a delay on the plant, the yeast fermentation was left for a period of 40 instead of 15 minutes and this, plus the lack of chilled water, led to a very lively, over-fermented, dough. The dough was processed through the normal plant so that the usual test bake procedure could not be followed. For example,

the sheet rollers of the moulder were set much closer than has been found desirable for doughs made from composite flours. Intermediate proof time (9 mins.) was high for such a lively dough, but could not be altered. The period of final proof (48 minutes at 45°C) and bake (36 minutes at 240°C) were also fixed by the plant. A four-piece bread was produced both as box (Plate 15a) and open type (Plate 15b). Oven temperature was too high for the open top bread and thus produced a burned crust.

Crumb texture was good, rather open and crustier than test bakery samples. Crumb softness, flavour and staling rate were similar but volume was slightly inferior.

It was concluded that with only very minor modifications to the plant bakery, bread equal to that produced in the test bakery would be obtainable from the recipe used.

Visitors

During the first six months of the bakery's existence, 26 visitors have come to the bakery, excluding commercial representatives and TPI personnel, and 13 these were from overseas, including trainees from Nigeria, and Nicaragua, each of whom spent a day working in the bakery.

Future Work

(a) Initial work was confined to mechanical development of dough using the Tweedy 35 machine and, latterly, for small samples, the Morton Duplex. Th advantages of mechanical dough development have been discussed frequently, notably for composite flours in the Hulse, Pringle and Williams paper. Howe the process can only be of benefit in countries where bread is made or will be made in plant bakeries, and where foreign exchange could be made available for purchasing suitable machinery.

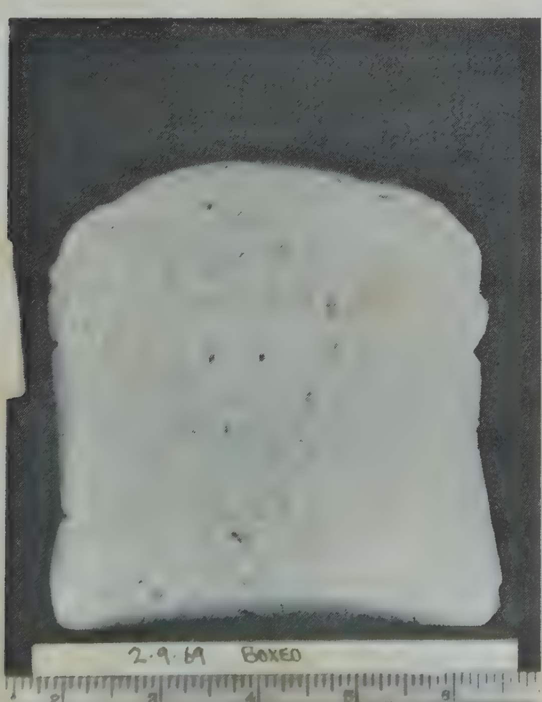
Now that two bakery technologists are working in the Culham Test Bakery, m emphasis can be given to other methods of bread-making, including bulk fermentation which is traditional in bread-eating countries, and perhaps, the use of "no-time doughs", which are developed by means other than mechanica work. If successful for composite flours, these other methods would be directly applicable in existing bakeries however small and under-mechanised even though the high levels of dilution possible by mechanical dough developm are less likely.

(b) Equipment will soon be available for measuring loaf volume and staling rates and it is hoped later to purchase equipment for assessing the gelling properties of starches and rheological properties of doughs, and a suitable m so that grain samples can be studied (at present, grain samples are being mi by the FMBRA at St. Albans).

(c) At present the TPI Test Bakery is testing flour from cassava, yam, ban sorghum, millet and wheat. Enquiries concerning these have been made by eight different developing countries.

Plate 14 Incorporation of rice flour (Recipe 5) 40% Cassava starch, 10% rice flour, 50% wheat flour ("Castle")

Plate 15 Commercial bakery production of bread from composite flour. Recipe 6 44% Cassava starch, 6% defatted soya flour, 50% wheat flour ("Castle")



(a) boxed loaf

(b) open tin loaf

(d) As well as extending our work on bread, as mentioned above, work will done on the use of non-wheat flour and protein supplements in the manufactu of other bakery products such as biscuits, doughnuts and cakes.

(e) More extensive training programmes are envisaged and staff of the Department will also be available to work in developing countries on technic and economic applications of the use of non-wheat flours in bakeries.

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30th September 1969

D A V Dendy
P A Clarke

RECIPES

Recipe 1 Hulse, Pringle & Williams 70/30 (Pringle, personal communica

	grams
Castle Flour	3500
Cassava Starch	1500
Salt	100
Yeast (compressed yeast equivalent)	150
Water (approx.)	3000
Oxidant (Bromate)	75
Diastatic Malt Flour	17.5
G M S (20% Emulsion in water)	100

Recipe 2

	grams
Castle wheat flour	2500
Cassava starch	2500
Salt	100
Yeast (dried)	65 (equivalent to 110-130 g. compressed)
Sucrose	70
Diastatic malt flour	20
Bread fat	35
Ascorbic Acid	150 ppm
Water (approx.)	2700

(N.B. ppm denotes parts per million of total composite flour weight)

Recipe 3 Yeast growth medium:
500 ml water @ 38°C
33 to 40 g. dried yeast
50 g. sucrose — Aerobic respiration for 1 hour
1 g. defatted soya flour
Trace fat (GMS)

Dough

	grams
Wheat flour	2500
Cassava starch	2500
Salt	100
Sucrose	50
Malt	20
Fat	35
Ascorbic Acid	150 ppm
Ammonium Chloride	300 ppm (yeast Stimulant)
Water (approx.)	2160

Control mix reconstitution:

500 ml water @ 38°C
65 g. yeast — 15 minutes (no air)
20 g. sucrose

Dough as above except NH_4Cl.

Recipe 4

60/40 Bread		50/50 Bread
780	Wheat flour	650
480	Cassava Starch	650
26	Salt	26
20	Yeast	20
18	Sucrose	18
5	Malt	5
9	Fat	9
150 ppm	Ascorbic	150 ppm
770	Water	760
40	White Coconut Protein (90% protein content)	50

Recipe 5

	grams
Wheat flour	2500
Cassava starch	2000
Rice flour	500
Salt	100
Yeast	75
Sucrose	70
Malt	20
Fat	35
Ascorbic	150 ppm
Water	2690

Recipe 6

Yeast Ferment	grams
Dried yeast	244
Sucrose	75
Water 38°C	1500

Dough

"Castle" wheat flour	9375
Cassava Starch	8250
Defatted soya flour	1125
Salt	375
Sucrose	188
Diastatic malt flour	75
Bread fat	131
Ascorbic Acid	150 ppm
Water	9413